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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,053	07/12/2001	Hung-Tien Yu	005552	3453

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EXAMINER
LEE, HSIEN MING

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/905,053	YU ET AL.
	Examiner	Art Unit
	Hsien-Ming Lee	2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 May 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-6 and 10-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6 and 10-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
4)☐ Interview Summary (PTO-413) Paper No(s) _____
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other

DETAILED ACTION

Remarks

1. Applicant's cancellation to claims 3 and 7-9 is acknowledged.

2. Claims 1, 2, 4-6 and 10-23 are pending in the application.

3. The Final rejection is withdrawn in response to amendment filed 5/6/03.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-2, 4, 6, 10, 13, 14 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Kelkar et al. (US 6,489,254).

In re claims 1-2, 6, 10, 13, Kelkar et al. teach the claimed deposition method capable of filling recesses in a substrate, comprising:

- providing a substrate 12 having recesses 16 between polysilicon gate 14 defining side walls and recess bottoms (Fig.1);
- exposing the substrate 12 to an energized deposition gas comprising a first component comprising O3 (i.e. ozone) and a second component comprising TEOS to deposit a first layer of a material 20 (undoped silicon oxide) in the recesses 16 (Fig.2) at different rates over the side walls and recess bottoms, i.e. by utilizing a *high ozone ratio* for depositing the first layer 20, it would achieve a high surface mobility

causing the first layer to despite at recess bottom faster than on the sidewalls due to the flow-like characteristic (col.4, lines 4-16); and

- reducing the ratio of the first component O3 to the second component TEOS (i.e. using *low ozone ratio*.col.4, lines 14-28) to deposit a second layer of the material 30 (doped silicon oxide, BPSG) over the first layer 20 in the recess 16 (Fig.3).

In re claims 4 and 14, Kelkar et al. also teach that the reducing step is performed by reducing the flow rate of O_3 *from* between about 120g/m3 and about 140g/m3 (col.3, lines 64-65) *to* between about 70 g/m3 and about 100 g/m3 (col. 4, lines 26-28).

In re claim 18, Kelkar et al. also teach depositing the first layer 20 to a sufficient thickness to fill the reentrant cavities 16 as shown in Fig.2.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 5, 11, 12, 15-17, 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kelkar et al. (US '254) in view of applicant's admitted prior art (hereinafter referred as "AAPA").

In re claims 5, 15 and 22, the selection of the time for the ratio-reducing step is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA

1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, the time for the ratio-reducing step depends on the aspect ratio of the recess, i.e. the higher aspect ratio the longer the time it becomes. In such situation, the applicant must show that the claimed time is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. See M.P.E.P. 2144.05 III.

In re claims 12, 19 and 23, the selection of the thickness of the first silicon oxide layer is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). For example, the thickness of the first silicon oxide may be optimized to a desired range so that the first silicon oxide is thick enough to substantially fill the bottom of the recess while still keeps the recess open. The open-recess is then filled with the second silicon oxide layer, which, in turn, would avoid the formation of voids in the recess. In such situation, the applicant must show that the claimed thickness range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. See M.P.E.P. 2144.05 III.

In re claims 11, 16 and 20, Kelkar et al. fail to teach the recesses have sidewall portions covered with silicon nitride spacers, and the silicon nitride spacers, the polysilicon gates and the other portions of the substrate are covered with a silicon nitride liner.

However, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to appreciate that the teachings of Kelkar et al. is an illustrative

example rather than restrictive; and obvious variations can be made without departing from the spirit and scope of the teachings of Kelkar et al (col.4, lines 60-67). For example, one of the ordinary skill in the art would have been motivated to apply the teachings of Kelkar et al to any situations that needs to fill the recess having a high aspect ratio as shown in AAPA.

In Fig. 1, AAPA teaches a structure having the recesses 27 being between polysilicon gates 22 and having sidewall portions covered with silicon nitride spacers 24, and wherein the silicon nitride spacers 24, the polysilicon gates 22 and the other portions of the substrate are covered with a silicon nitride liner 26; and the recesses 27 are filled with the silicon oxide 28.

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to apply the teachings of Kelkar et al. to the AAPA's structure with a reasonable expectation of success because it would achieve same results, i.e. capable of filling high-aspect-ratio recesses without having voids.

In re claim 17, Kelkar et al. in view of AAPA teach that the silicon nitride liner 26 comprises reentrant cavities as shown in Fig.1 of AAPA; and the reentrant cavities are smoothened by the first silicon oxide layer of Kelkar et al.

In re claim 21, Kelkar et al. in view of AAPA teach that the ratio-reducing step is performed by reducing the flow rate of O_3 as stated above.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shufflebotham et al. to US 6,106,678 teach the common subject matter.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
Art Unit 2823

May 20, 2003